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THE EFFECTS OF AUTOMOBILE EXHAUST FUMES ON RESPIRATORY FUNCTION — On Workers in Polluted Places of Work —*

by

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Objective

For the investigation of the effects of automobile exhaust fumes, we have been conducting in recent years the measurement of, among other things, CO concentration of exhaled air and the lead content of urine and blood. But in view of the fact that exhaust fumes also contain NO, NO_2 and dust, effects on the respiratory organs are also conceivable. On this occasion, we will report on a comparative study concerning the respiratory function which was conducted among persons exposed to automobile exhaust fumes.

Method of Measurement

The period was from June 1969 to March 1971. The subjects were 235 residents of localities around trunk roads (Higashinari ward and Abeno ward in Osaka City), 203 control group residents, 60 policemen

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on outdoor traffic duty, 67 policemen on indoor duties, 69 highway toll station attendants, 24 underground parking lot attendants and 45 loading and unloading workers for newspaper and mail delivery trucks, for a total of 703 persons. The items measured concerned the respiratory function (vital capacity, vital capacity ratio, 1-second volume, 1-second ratio and type of respiratory disfunction recorded by means of a Vitalor). The vital capacity ratio was calculated by taking the ratio of the measured value to the standard vital capacity which was computed for each individual from his height and age (Ebina method). For the classification of the respiratory function types, the Sasamoto classification method was used. That is to say: normal — vital capacity ratio of over 80% and 1-second ratio of over 70%, restrained — vital capacity ratio of under 80% and 1-second ratio of over 70%, obstructive — vital capacity ratio of over 80% and 1-second ratio of under 70%, and composite — vital capacity ratio of under 80% and 1-second ratio of under 70%.

Results of Measurement

The results are as shown in Table 1. Neither with respect to vital capacity nor with respect to the 1-second ratio can any significant differences be detected between the residents, policemen and persons employed at the various polluted places of work, between the exposed group and the control group, or between smokers and non-smokers. However, the vital capacity ratio is slightly lower in the resident, smoker and over 40 group, while the 1-second ratio shows slightly lower values in the exposed resident, smoker and over 40 group and the over 40 group among persons employed at the various polluted places of work (both smokers and non-smokers).

When the obstructive classification among the pulmonary function types based on the vital capacity ratio and the 1-second ratio was examined, it was found that 3% of the exposed residents, 4% of the control group, 0% of both outdoor and indoor duty policemen and 9% of the persons employed at the various polluted places of work belonged to this category, so that the percentage was the

highest for the persons employed at the various polluted places of work.

Table 1 Vital capacity ratio, 1-second ratio

	1					2				
	3		4		5	3		4		5
	6	7	8	9		6	7	8	9	
10	807±172	765±189	929±106	931±102	864±127	810± 75	818± 83	833± 59	827± 56	797± 96
11	946±135	952±160	1001±112	971± 91	948±113	872± 70	894± 55	869± 49	873± 60	860± 58
12										
10	775±138	782±172	915±105	922±105	878±187	797± 99	810± 77	830± 59	832± 47	796± 89
11	954±111	928± 84	1005±119	950± 72	996± 79	882± 59	893± 51	856± 56	827± 45	862± 59
14	871±161	833±166	946±117	927±103	903±136	848± 88	821± 77	839± 59	831± 47	813± 87
13										
10	824±166	832±135	935±117	949± 86	844± 87	862± 47	832± 69	838± 65	817± 59	794±109
11	953±127	958±159	998±101	980± 87	945±128	862± 78	893± 62	886± 38	893± 55	859± 56
14	890±168	876±161	969±110	955± 91	890±172	853± 53	859± 72	861± 55	856± 72	827± 92

Key:
1. Vital capacity ratio %
2. 1-second ratio %
3. Residents
4. Policemen
5. Persons employed at polluted places of work
6. Exposed
7. Control
8. Outdoor traffic duty
9. Indoor duty
10. Over 40
11. Under 39
12. Smokers
13. Non-smokers
14. Total

* Japanese title: Kokyukino e oyobosu jidosha haigasu no eikyo — Osen shokuba kinmuin ni tsuite —